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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/694,814	10/29/2003	Joon-Seop Kwak	030681-590	4551

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EXAMINER	
DANG, TRUNG Q	
ART UNIT	PAPER NUMBER
2823	

DATE MAILED: 09/03/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/694,814	KWAK, JOON-SEOP	
	Examiner	Art Unit	
	Trung Dang	2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-24 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-24 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

2. Claims 1-5, 7-8, and 10-11 are rejected under 35 U.S.C. 102(e) as being anticipated by Oh et al. (U.S. Pat. 6,734,091).

Oh et al. teach method for manufacturing a light emitting device comprising at least one layer of a p-type GaN semiconductor layer on an active layer where light is generated and a p-type electrode on the p-type GaN semiconductor layer (col. 4, lines 26- 35), the method comprising:

forming the p-type GaN semiconductor layer on the active layer;

annealing the p-type GaN semiconductor layer at a temperature above 600 °C in a nitrogen environment for 10 minutes or more (col. 2, lines 52- 67; col. 4, lines 20-25);

forming a first metallic layer selected from a group consisting of palladium (Pd), nickel (Ni), platinum (Pt), gold (Au) or combination thereof on the p-type GaN semiconductor layer (see col. 5, lines 21-23, and claim 5);

forming a second metallic layer on the first metallic layer;

annealing the first and second metallic layers in an oxygen-containing atmosphere or in air at a temperature of about 400 °C to about 550 °C for 30 seconds to 1 hour (col.5, lines 39-55);

forming a p-type electrode by depositing a third metallic layer on the annealed metallic layers (col. 5, lines 39-42).

Noted that the step of annealing the p-type GaN semiconductor layer in nitrogen atmosphere reads on the claimed first annealing, and the step of annealing the first and second metallic layers in the oxygen containing atmosphere or in air (the p-type GaN semiconductor layer is also subject to the same anneal) reads on the claimed second annealing because the claims employ "comprising" format, which do not exclude the step of forming the first and second metallic layers of the reference. Thus, the p-type GaN semiconductor layer is annealed twice as claimed. Also, the step of forming the third metallic layer reads on the claimed forming the p-type electrode because the forming of third metallic layer completes the formation of the p-type electrode.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 9, 12-17, and 19-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over the admitted prior art in view of Oh et al. as above.

The admitted prior art depicted in Fig. 2 teaches a method for manufacturing

a light emitting device, the method comprising:

forming an n-type compound semiconductor layer (12) on a substrate;

forming an active layer (28) on the n-type compound semiconductor layer (12), the active layer where light is generated;

forming a p-type compound semiconductor layer comprises a lower p-type semiconductor cladding layer (32) and an upper p-type GaN semiconductor layer (34) on the active layer (28);

forming a p-type electrode (38) contacting the upper p-type GaN semiconductor layer (34), and

forming an n-type electrode (40) to contact the n-type compound semiconductor layer (12).

The admitted prior art differs from the claims in not disclosing the step of annealing twice the structure including the p-type compound semiconductor.

Oh et al. teach that the conductivity of a p-type GaN semiconductor layer (also known in the related art as contact layer) is improved by annealing the p-type GaN semiconductor layer at a temperature above 600 °C in a nitrogen environment for 10 minutes or more (col. 4, lines 20-25). Thus, it would have been obvious to anneal the p-type GaN contact layer (34) of the admitted prior art in a nitrogen atmosphere as suggested by Oh et al. because the annealing would activate the p-type impurity, hence lower the resistivity of the contact layer (34).

Oh et al. further teach a process of forming a p-type electrode on a p-type GaN semiconductor layer, said p-type electrode provides good ohmic contact to the p-type GaN semiconductor layer and, thus, lower the operating voltage of the device (see Abstract). The method comprises: forming a first metallic layer selected from a group consisting of palladium (Pd), nickel (Ni), platinum (Pt), gold (Au) or combination thereof on the p-type GaN semiconductor layer (see col. 5, lines 21-23, and claim 5); forming a second metallic layer on the first metallic layer; annealing

the first and second metallic layers in an oxygen containing atmosphere or in air at a temperature of about 400 °C to about 550 °C for 30 seconds to 1 hour (col. 5, lines 39-55); forming a p-type electrode by depositing a third metallic layer on the annealed metallic layers (col. 5, lines 39-42).

It would have been obvious to one of ordinary skill in the art to modify the teaching of the admitted prior art by forming the p-type electrode (38) according to the method suggested by Oh et al. because this would provide good ohmic contact to the p-type GaN contact layer (34) and, thus, lower the operating voltage of the device. Noted that the claimed limitation regarding the annealing twice the resultant structure is met by the first annealing in nitrogen atmosphere and the second annealing in oxygen atmosphere taught in Oh et al. because the claims employ "comprising" format which do not exclude the step of forming the first and second metallic layers of the reference.

5. Claims 1-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rennie (U.S. Pat. 6,057,564) in view of Okumura (U.S. Pat. 6,370,176).

With reference to Fig. 7, Rennie teaches method for manufacturing a light emitting device comprising the steps of:

forming at least one layer of n-type compound semiconductor layer (layer 2 and 4) on a substrate (1);

forming an active layer (6) on the n-type compound semiconductor layer, the active layer where light is generated;

forming at least one layer of p-type compound semiconductor layer (layer 7, 8, and 9) on the active layer (6);

thermally treating the resultant structure in an oxygen ambient to form an oxide layer (30) on the p-type compound semiconductor layer (9) so as to obtain a low resistance ohmic contact (see col. 2, lines 3-21; col. 6, lines 54-60; col. 7, lines 49-52);

forming a p-type electrode (11) on the p-type compound semiconductor layer (9); and

forming an n-type electrode (3) to contact the n-type compound semiconductor layer (2).

Noted that, the thermally treating the resultant structure in an oxygen ambient disclosed in the reference reads on the claimed second annealing because annealing involves a heat treatment of the structure. Also, see col. 2, lines 26-29 for a teaching of a p-type electrode comprises metal selected from the group consisting of Ni, Pd, Au and Pt or an alloy thereof, hence the claimed limitations of claims 5-7, 10, 17-19, and 22 concerning a p-type electrode is formed as a single layer or a multi layer of Pd, Ni, Pt, or Au are met by the reference.

Rennie differs from the claims in not disclosing the claimed first annealing in nitrogen atmosphere.

Okumura teaches a method for forming a GaN group semiconductor laser device having a structure depicted in Fig.1 in which, prior to forming a p-type electrode (12), the p-type GaN layer (11) is annealed in a nitrogen atmosphere to reduce the resistance of the layer (col. 8, lines 44-46).

It would have been obvious to one of ordinary skill in the art to modify Rennie's teaching by annealing the p-type GaN contact layer (9) in Fig. 7 after it is formed in a nitrogen atmosphere as suggested by Okumura for the benefit of reducing the resistance of the p-type GaN contact layer (9). Noted that this annealing in nitrogen atmosphere reads on the claimed first annealing. Thus, the combined teaching results in the p-type GaN contact layer (9) in Fig. 7 is annealed twice, one in nitrogen atmosphere to reduce the resistance and the other in oxygen atmosphere to obtain a low resistance ohmic contact with the p-type electrode (11).

As for claims 3-4, 15-16, see Okumura col. 8, line 45 for the temperature at which the first annealing is performed and Rennie col.7, line 49 the temperature at

which the second annealing is performed. Although Okumura and Rennie are silent about the annealing durations as claimed, it is well settle that, absent a showing of criticality by applicant, the determination of the claimed annealing duration would have been obvious to one of ordinary skill in the art since it has been held that, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable range by routine experimentation. In re Boesch, 617 F_2d 272, 205 USPQ 215 (CCPA 1980); In re Sola 25 USPQ 433 (CCPA); In re Waite 77 USPQ 586 (CCPA).

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Trung Dang whose telephone number is 571-272-1857. The examiner can normally be reached on Mon-Friday 9:30am-6:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 571-272-1855. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Trung Dang
Primary Examiner
Art Unit 2823

08/30/04